Barton, D. 2002. The transferability of benefit transfer: contingent valuation of water quality improvements in Costa Rica. *Ecological Economics*, 42(1-2): 147-164.

The purpose of this study is to test common hypotheses of the convergent validity of BT and to discuss trade-offs in the design of the underlying CV studies in a developing country context. This study tests the reliability of transferring WTP estimates of improvements in coastal water quality between and within two urban areas along the Pacific Coast of Costa Rica, in the context of a benefit-cost analysis of centralized sewage treatment options. Identical CV studies of WTP for improvements in coastal water quality were conducted in the town of Jaco and city of Puntarenas on the Pacific Coast of Costa Rica. Several common hypotheses for BT reliability were tested for the transfer of WTP estimates between the two communities, as well as between districts within Puntarenas.

Tests of the predictive powers, or reliability, of BT have been divided into 'convergent validity tests' between at least two sites with primary valuation studies, and 'value surface tests' based on meta-analysis of multiple valuation studies. Significant explanatory variables are different from site to site, with socio-demographics mainly explaining WTP in Puntarenas, while in Jaco it is sanitation, resource use and environmental attitudes which explain much of variation in WTP

For this particular study, benefit function transfer is not more reliable than transfer of unadjusted and simple adjusted mean WTP. Burton finds that sanitation, use, and environmental attitude related variables may be driving transfer errors across transfer contexts, rather than the more readily available socio-economic household characteristics. He also finds that designing as ideal a benefit transfer experiment as possible, reduces the transferability of results regarding reliability to other policy-contexts. He recommends that the BT researcher should seek sites that are different, while trying to control for the differences. Choice modeling promises more flexibility than CV in controlling for multiple site-differences. Meta-analyses will in the future be needed in order to uncover easily available socio-economic and environmental characteristics that consistently predict WTP across multiple contexts.
--This looks at transferring estimates across space not time

Bergstrom, J. C. and L. O. Taylor. 2006. Using meta-analysis for benefits transfer: Theory and practice. *Ecological Economics*, 60(2): 351-360.

This study reviews the theory behind and practice of using meta-analysis for BT. The authors state that even within the same valuation methodology, such as CV, pooling of primary data may not be feasible because of divergent data structures resulting from different estimation methods. It will often be the case that one cannot pool data from enough studies to be sufficiently
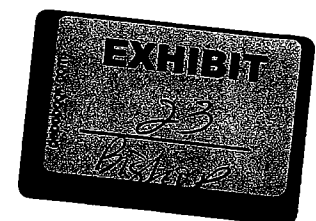
Exhibit H

representative of the whole literature on a topic. The author identifies several criteria that a MA-BT model should meet.

An empirical MA-BT model should include *core economic variables* which include measures of price, income, quality, substitutes, and household characteristics. Studies should satisfy *commodity consistency,* which requires that the commodity being valued, must be fundamentally the same within and across studies. Assembled studies should satisfy *welfare change measure consistency,* which requires that all measures of WTP within and across studies included in a MA-BT model should represent the same Hicksian exact welfare change measure, or ex-post calibrations should be made to account for theoretical differences between welfare change measures estimated within and across studies. MA-BT models should also satisfy *study design variable consistency.* This type of consistency controls for heterogeneity across studies due to major differences in study design or methodology.

The authors expect that MA-BT models will be sufficiently accurate tools for applications requiring low to moderate accuracy (e.g., screening, minor policy decisions). For applications requiring moderate to high accuracy (e.g., litigation, major policy decisions), primary data studies will probably still be preferred over MA-BT models. Aggregating results across studies, MA-BT models may lose the rich detail from individual studies which help to understand and apply time-and-space specific values to specific policy questions and issues.
--Looking at last paragraph, it says that MA-BT studies probably aren't appropriate for litigation purposes, although we are looking to do BT over the same population just in the past, so this may be a bit more reliable.

Bergstrom, J. and P. De Civita. 2005. Status of benefits transfer in the United States and Canada: A review. *Canadian Journal of Agricultural Economics*, 47(1): 79-87.

The study provides a review of the current status of benefits transfer applications by government agencies in the United States and Canada. The authors divide benefits transfer methods into three major types: fixed value transfer, expert judgment, and value estimator models. *Fixed value transfer:* total benefits at the policy site are estimated by aggregating existing standard values per unit derived from study site data. *Expert judgment:* total benefits at the policy site are estimated by aggregating values per unit derived from an expert judgment or opinion process. *Value estimator model:* estimator models derived from study site data are used with explanatory variable data collected at the policy site to estimate both value per unit and total units at the policy site.

In the case of natural resource and environmental policies and projects, benefits transfer involves transferring value estimates from a "study site" to a "policy site" where sites can vary across geographic space and or time.

The authors discuss several sources of errors of BT techniques. *Commodity measurement error* refers to errors associated with specifying and measuring policy site and study site commodities and available substitutes and complements to those commodities. *Population characteristic measurement error* refers to errors associated with identifying and measuring socio-economic characteristics of the policy site and study site populations. *Welfare change measurement error* refers to errors associated with the theoretical consistency of welfare change measures across the study and policy sites. *Physio-economic linkage measurement error* refers to errors associated with identifying and measuring linkages between the physical world and economic behavior and values. *Estimation procedure and judgment error* refers to errors associated with statistical estimation procedures and subjective professional judgments, which are a necessary component of statistical estimation.

Convergent validity tests (difference in means or coefficients for two independently estimated sites—policy and study—to see if equations or unit estimates are similar enough statistically for BT to have been used for policy site from study site results alone) conducted in previous studies suggest that equation transfers are more feasible and defensible than unit transfers.(82).

However, if benefits transfer is used as a basis for determining just compensation in the context of natural resource damage litigation, the costs of a wrong decision to individuals and society could be quite high (83)

The authors note that in the US, despite the recognized limitations of benefits transfer, the technique is widely used by government agencies to facilitate benefit-cost analysis of public policies and projects affecting natural resources. NOAA allows BT under this rule, three basic issues must be considered in determining transfer appropriateness:...the comparability of the users and of the natural resource and/or service being valued in the initial studies and the transfer context; the comparability of the change in quality or quantity of natural resources and/or services in the initial study and in the transfer context (where relevant); and the quality of the studies

The use of benefits transfer has been challenged on a very limited basis in the U.S. courts with mixed results. In the case, Lac Courte Oreilles Band of Lake Superior Chippewa Indians vs. State of Wisconsin (1988), a type of benefit transfer using expert judgment was allowed by which beef prices were used as a proxy for the value of deer. In another case, State of Idaho vs. Southern Refrigerated Transport, Inc. (1991), existence value estimates from a study site were not allowed as evidence for loss of existence value at the policy site. Empirical studies to date suggest that more sophisticated techniques are needed to improve benefits transfer techniques. Value estimator models appear to represent the most promising benefits transfer technique in

terms of accuracy and reliability. The most pressing need is for the development of formal and accepted benefits transfer protocols.

> --This mention of court cases comes from Brookshire and Neil Water Resources Journal 1992 reference In this paper.
>
> **Brookshire, D. S. and H. R. Neill. 1992. Benefit transfers: Conceptual and empirical issues.** *Water Resources Research*, 28(3): 651-655.
>
>> --This proxying apparently happens within the confines of a court room many times (652 In B&N).
>>
>> --It Is possible that there have been many cases in hearings and the courts where CV data were utilized In a BT application (652) We are only able to ID one such situation. In the State of Idaho vs. Southern Refrigerated Transport, Inc. (1991), existence value estimates from a study site were not allowed as evidence for loss of existence value at the policy site. The court argued that the CV study did not prove the damages occurred with certainty regarding the fisheries' existence value.--**This was not done across time however.**
>>
>> --The recent State of Ohio v. US Dept. of Interior 1989 case opened the door for the introduction of CV studies. (652)

--**The most useful point for OK Chickens to come from this article appears to be the passage: " The use of benefits transfer has been challenged on a very limited basis in the U.S. courts with mixed results." Also says above that transfer can be done across time.**

Boyle, K. J., Poe, G. L. and J. C. Bergstrom. 1994. What do we know about groundwater values? Preliminary implications from a meta analysis of contingent-valuation studies. *American Journal of Agricultural Economics*, 76(5): 1055-1061.

The paper uses a meta analysis to statistically investigate whether eight CV studies of groundwater protection collectively provide a richer picture of the benefits of groundwater protection than can be developed from a qualitative comparison of the study features and results. These CV studies present a wide variety of applications, but there is limited depth pertaining to specific attributes of the general groundwater valuation problem.

In selecting dependent variable observations from each study, the authors selected unique point estimates reported in each of the studies. If a study estimated values for several different scenarios of groundwater contamination, estimated means for each scenario are included in the analysis. The authors try to account for all variables that describe the change in groundwater contamination. They find a major limitation of the meta analysis is an inconsistent definition of groundwater contamination across studies. Although they find the core variables demonstrate remarkable consistency across equations. The authors feel that future studies should define changes in groundwater in a clear and consistent manner, and carry this improved scenario design forward to data analyses and reporting of empirical results.

-Although a meta-analysis, the point about incompatibility in the contamination variable measurement is an issue for benefits transfer in the change in environmental quality isn't equal (not to mention that people's environmental preferences and socio-economic characteristics are different.

Boyle, K. J., Poor, P. J. and L. O. Taylor. 1999. Estimating the demand for protecting freshwater lakes from eutrophication. *American Journal of Agricultural Economics, 81(5): 1118-1122.*

The research uses separate real estate markets to identify demand parameters for an environmental amenity. Hedonic price functions are estimated for four market areas that are distinguished by being in different multiple listing regions, having different regional characteristics, and by their distances from each other. The authors report the estimated demand for lake-water clarity and investigate the effect of own price and surplus measures for three different specifications of demand.

They find that it is possible to use independent, implicit price estimates from distinct markets to identify the demand parameters for an environmental amenity in a second-stage, hedonic demand model. They find the most credibility in the semilog and Cobb-Douglas specifications. From a policy perspective, the authors believe the semilog model would provide the most conservative welfare estimates.
--More of a meta-analysis than a BT

Brouwer, R. and F. Spaninks. 1999. The validity of transferring environmental benefits: Further empirical testing. *Environmental and Resource Economics,* **14(1): 95-117.**

The authors compare the findings of two CV studies carried out in the Netherlands shortly after each other with regard to agricultural wildlife management on Dutch peat meadow land. Probably most favorable for BT is the fact that both studies concentrated on the same type of environmental goods in similar areas, namely the amenities (flowery ditch-sides and meadow birds) found on agricultural peat meadow land. The objective of this paper is to quantitatively test the validity of actually transferring the estimated environmental benefits in both studies from one site to another, taking into account the distortions detected in the individual studies, namely temporal embedding and distance-decay effects.

Although average WTP and the statistical distribution of stated WTP amounts are the same in both surveys, the null hypothesis of equal benefit functions was rejected convincingly. The transferability of benefit functions does not hold, even though the authors tried to account for the distortions detected in the surveys separately. Although the authors believed they had established

a firm basis for successful benefits transfer, they state they are in need of more studies to see how much control actually is necessary to make benefits transfer a viable valuation method. **--A disappointing result of how BT fails even when study sites are close and the environmental good is identical.**

Brouwer, R., Langford, I. H., Batemen, I. J. and R. K. Turner. 1999. A meta-analysis of wetland contingent valuation studies. *Regional Environmental Change*, 1(1): 47-57.

The main objective of this study is to quantify the socio-economic values associated with wetland ecosystem. The results from 30 different CV studies of wetlands in temperate climate zones in developed economies were compared and synthesized in a meta-analysis. The studies included in the analysis focus primarily on wetlands or wetland-type areas. The specific WTP questions addressed in each study cover a large continuum of activities, actions or projects related to wetlands, but in some cases also to water resources in general.

Most of the reviewed studies asked respondents for the use and non-use values attached to the benefits derived from wetland functions. In eight studies an attempt was made to break down the stated total economic value ex post in the questionnaire into the various components distinguished in the literature, e.g. use, option, philanthropic, bequest, stewardship and existence value. In two water quality studies respondents were presented ex ante with a 'value card' which described the main reasons why water quality might be valued. In another two studies use and non-use values were elicited separately, by the use of either different questionnaires or separate questions for use and non-use values in the same questionnaire. Finally, two study quality indicators were included in the analysis: one for the quality of the studies included in the meta-analysis and one for the quality of the meta-analysis itself.

The analysis presents a simple breakdown of the functions into independent components. The authors state that the distinction between four main wetland functions does not necessarily correspond with people's perception of the various functions wetlands perform. This depends upon their own knowledge and experience with the resource. The study develops a statistical multilevel model which accounts for the clustering of results from the same studies.

The study concludes that in meta-analysis, inferences are made on the basis of information on global statistics, such as the mean and standard deviations of parameter estimates. These may or may not describe individual behavior adequately. In order to overcome this potential problem and to increase the study's validity and reliability, the authors feel a logical next step would be to gather more information about sample population characteristics by complementing the analysis with the underlying individual responses. This provides an important test of the appropriateness of meta-analysis as an instrument to synthesize CV outcomes for the purpose of value transfer.

--More of an MT than a BT

Desvousges, W. H., Naughton, M. C. and G. R. Parsons. 1992. Benefit transfer: conceptual problems in estimating water quality benefits using existing studies. *Water Resources Research*, **28(3): 675-683.**

The authors assess the potential usefulness of BT in policy evaluation. They use an analysis conducted for the EPA on the pulp and paper industry. The EPA was faced with the task of evaluating benefits at a number of different river segments within a short time frame. 8 studies were found that provided estimates of the value of water quality improvements and provided a published model based on sound economic method, and for which sufficient data were available at the policy sites to enable transfer.

The authors identify five major problems in the transfer procedure. The existing literature does not provide guidance on market size, which may lead to potentially large biases in either direction the aggregate benefit estimates. The WTP estimates are for broad qualitative ranges such as boatable to fishable or fishable to swimable, while the actual changes at the policy site are frequently over small increments. None of the studies consider the relationship between site characteristics and value of improvements in a meaningful way. This can be a major source of transfer error. None of the studies provide usable estimates for substitute prices. This makes it extremely difficult to define a relationship between available substitutes and benefit estimates at the policy site. Finally, the studies measure different categories of user and nonuser benefits.

The authors conclude that benefit estimation places many limitations on the effectiveness of BT. There are no clear guidelines for judging adequacy or scientific soundness of existing studies. Experience suggests that finding study sites that correspond to policy sites is a major concern, with regard to site characteristics and substitutes. The authors also find that many of the available CV studies for transfer assume a linear relationship between compensating surplus and its determinants. They present four recommendations for the design of future valuation studies. First, they recommend estimating multi-site models, which would allow a policy analyst to control for how values of water quality improvements vary with characteristics of the site being cleaned. Second, compare multi-site models of the same structure in estimated in different areas. They also recommend experimenting with explanatory variables in multi-site models that are readily available.
--A pessimistic evaluation of the BT methodology, at least when existing studies are applied to a different policy site. Lists out the common concerns of BT.

Downing, M. and T. Ozuna Jr. 1996. Testing the reliability of the benefit function transfer approach. *Journal of Environmental Economics and Management*, **30(3): 316-322.**

This article presents an experiment designed to test the reliability of the benefit function transfer approach using CV methods. The experiment uses data collected from anglers surveyed across eight contiguous Texas Gulf Coast bay regions over three distinct time periods.

The authors also show that due to nonlinearities in the WTP functions, statistical equality of the estimated model parameters does not necessarily imply statistical equality of the resulting benefit estimates. The authors suspect that the nonlinearity of the logit model used to estimate the benefit functions and the nonlinearity of the benefits estimates themselves greatly contribute to this result. The nonlinearities introduce possible asymmetries which lead to the divergence between statistically similar benefit functions and their respective benefit estimates.
--...

U.S. Environmental Protection Agency. 1999. The benefits and costs of the clean air act 1990 to 2010. Report 410-R-99-001. Washington, DC: Office of Air and Radiation, USEPA. Internet: http://www.epa.gov/oar/sect812/copy99.html.

Chapter 6 of this retrospective covers the "Economic Valuation of Human Health Effects". The chapter begins with an brief review of the economic concepts behind valuing human health effects in a cost-benefit context and a summary of the unit values applied to health endpoints. It follows with a discussion of how to derive valuation estimates for specific health effects. The paper uses a mortality risk valuation estimate which is based on an analysis of 26 policy-relevant value-of-life studies. Five of the 26 studies are CV studies

The transferability of estimates of the value of a statistical life from the 26 studies to a benefit analysis rests on the assumption that, within a reasonable range, WTP for reductions in mortality risk is linear in risk reduction. The appropriateness of the mean of the WTP estimates from the 26 studies for valuing the mortality-related benefits of reductions in pollutant concentrations therefore depends not only on the quality of the studies, but also on the extent to which the subjects in the studies are similar to the population affected by changes in air pollution and the extent to which the risks being valued are similar.
--...

Hanley, N., MacMillan, D., Wright, R., Bullock, C., Simpson, I., Parsisson, D. and B. Crabtree. 1998. Contingent valuation versus choice experiments: Estimating the benefits of environmentally sensitive areas in Scotland. *Journal of Agricultural Economics*, 49(1): 1-15.

This paper compares two direct valuation methods, dichotomous choice contingent valuation and choice experiments, to value the economic benefits of Environmentally Sensitive Areas (ESA) in

Scotland. The ESAs a designated areas in the UK which are of special landscape and/or conservation interest. ESAs work similar to conversation easements in the US for farmers.

The authors identify 3 advantages of CE over CVM. (1) It is easier to disaggregate values for environmental resources into the values of the characteristics that describe the resource. (2) CE avoids the part-whole bias problem of CVM, since different levels of the good can easily built into the environmental design. (3) CE avoids the yea-saying problem met in DC-CVM. The initial stage in the CVM survey was to conduct a pilot attitudes survey amongst 300 random respondents. The target populations for the survey were the general public, residents in the ESAs and visitors. For the CE experiment, an initial pilot survey showed that face-to-face interviews were necessary to obtain satisfactory completion and understanding of the questionnaire.

The authors state that benefits transfer approach using the CE approach offers the greatest potential. This is due to the decomposition of total value for any environmental resource into characteristic values. If environmental goods can be at least partly described in terms of their measurable characteristics, then CE estimates of marginal WTP can be used to estimate benefits at other sites. The authors conclude that CVM seems best suited to valuing an overall policy package, while CE is best at valuing the individual characteristics that make up the policy. **--Seemingly nothing to do with BT**

Johnston, R. J., Besedin, E. Y., Iovanna, R., Miller, C. J., Wardwell, R. F. and M. H. Ranson. 2005. Systematic variation in willingness to pay for aquatic resource improvements and implications for benefit transfer: A meta-analysis. *Canadian Journal of Agricultural Economics*, 53(2-3): 221-248.

This paper describes a meta-analysis conducted to identify systematic patterns in WTP for aquatic resource improvements. The main goal is to assess whether variation in WTP for aquatic resources may be explained sufficiently by systematic variation in policy, context, and other observable attributes to justify attempts at benefit transfer, or whether WTP variation is dominated by unexplained or study-level factors. The authors state that the applicability of meta-analysis to any particular research question is dependent on the quality and comparability of the available data.

The data are drawn from non-market valuation studies that estimate total WTP for water quality changes that affect aquatic life habitats and/or recreational fishing and other recreational uses. From a selection of than 300 identified surface water valuation studies addressing such resource types, 34 were found to be suitable for inclusion in the metadata. The resulting metadata comprise 81 observations from 34 unique studies conducted between 1973 and 2001. Attributes are categorized into those characterizing (1) study and methodology, (2) surveyed populations, (3) geographic region and scale, (4) water-body type, and (5) resource condition and

change.

The authors find that results are promising with regard to the ability of meta-analysis to identify systematic components of WTP and reveal patterns that may be unapparent from stated preference models considered in isolation. They find intuitive and statistically significant relationships between a range of independent variables and WTP, including findings that indicate strong sensitivity to scope in various dimensions. WTP is shown to be sensitive to such factors as geographical region, sample characteristics, water body type, habitat type, and a variety of study design attributes. The authors state that challenges involve methodological choices faced by researchers, and remain salient even in cases where the statistical performance of meta-models may be exemplary. Given strong systematic variation in WTP, the ability of researchers and policymakers to agree on standard guidance for policy applications of meta-analysis and benefit transfer may have significant implications for the future role of such methods in applied welfare analysis.
--Article seems to say BT can certainly work since there are common systematic components of WTP across a range of studies

Kirchhoff, S., Colby, B. and J. T. LaFrance. 1997. Evaluating the performance of benefit transfer: An empirical inquiry. *Journal of Environmental Economics and Management*, 33(1): 75-93.

The article summarizes the results of testing three alternative hypotheses regarding the validity of BT procedures and also discusses its implications for the practice of BT. The study focuses on a CV survey for the protection and preservation of two pairs of recreation sites, one pair in southern Arizona and one pair in northern New Mexico

The authors identify several tests that are available, starting with the *likelihood ratio test*. Using that test, the authors strongly reject equality of the benefit functions across sites. The authors propose several alternative tests of the reliability of BT using confidence intervals around the predicted benefit estimates. The *convergent validity of benefit function transfer* tests whether the compensating variation estimate for the policy site obtained by transferring the benefit function from the study site is statistically different from the original estimate for the policy site. The *convergent validity of direct benefit transfer* tests the reliability of the common practice of simply using the predicted WTP for the study site as a benefit estimate for the policy site, without adjusting for differences in the independent variables. A *Comparison of Actual Sample Means* occurs when the actual sample mean compensating variation for the policy site is also compared to the benefit transfer estimates.

The authors find that minor differences in the description of the resource to be valued and in visitor activities do not necessarily cause significant differences in benefit estimates as long as

the underlying resource condition is the same. Other differences in site characteristics can influence the quality of recreation experiences and apparently can cause substantial biases in benefit transfer estimates. The authors state that multi-site studies would be helpful in determining the effect of various site characteristics and market conditions on the performance of benefit transfers. Benefit function transfer performed better in nearly all of the cases examined here than did the direct transfer of the site estimate. They recommend that policy makers need to carefully choose appropriate sites for benefit transfer. In particular, the study and the policy sites should be similar with respect to recreation activities, quality of the recreational experience and the availability of substitutes.

--Found that BT could be used for two pairs of recreation sites in SW with a convergent validity of benefit function transfer test. In other words, the benefit functions were not found to be statistically different across the two area of interest. Thus, one site could have been used as a study site and the other a policy with reasonable reliability.

Navrud, S. 2001. Comparing valuation exercises in Europe and the United States – challenges for benefit transfer and some policy implications. In: *Valuation of Biodiversity Benefits: Selected Studies*. Biller, D. and Bark, R. (eds). OECD, Paris, pp. 63-77.

The author reviews the use of selected original biodiversity valuation studies by decision makers in Norway. About 30 empirical environmental valuation studies of biodiversity have been carried out in Norway since the early 1980s. Results from validity tests show that the uncertainty in benefit transfers both spatially and intertemporally could be quite large. Thus, the author states that benefit transfer should be applied to uses of environmental valuation where the demand for accuracy is not too high. Navrud lists four main difficulties or challenges in benefit transfer:

1. Availability and quality of existing studies;
2. Valuation of new policies or projects are difficult in respect of: expected change resulting from a policy is outside the range of previous experience discrete versus marginal change increase versus decrease in environmental quality;
3. Differences in the study site(s) and policy sites that are not accounted for in the specification of the valuation model or in the procedure used to adjust the unit value;
4. The determination of the "extent of the market". To calculate aggregated benefits the mean benefit estimate has to multiplied with the total number of affected households (i.e. households that find their well-being affected by the change in the quality of the environmental good). There is a need for guidelines on how to determine the size of the affected population.

Navrud concludes that the policy response to these main challenges in benefit transfer could be the development of improved benefit transfer techniques and a protocol for benefit transfer (including guidelines on how to determine the "size of the market", and ii) the establishment of a database of environmental valuation studies (like EVRI). There is a need to increase the number

of existing valuation studies captured in the database, but there is also a need for new, original valuation studies, which have been designed with benefit transfer in mind.

--This study argues that the time element of BT can cause large uncertainty: "Results from validity tests show that the uncertainty in benefit transfers both spatially and intertemporally could be quite large. Thus, the author states that benefit transfer should be applied to uses of environmental valuation where the demand for accuracy is not too high."

Pearce, D., Dubourg, R., Day, B., Atkinson, G., Navrud, S., Ready, R., Kuik, O., Spaninks, F., Labandeira-Villot, X., Rodriguez, M. V., Machado, F. S. and S. Mourato. 1999. Benefits transfer and the economic valuation of environmental damage in the European Union: With special reference to health. *Report to the European Commission under the European Union's Environmental and Climate Change Research Programme (1994-1998),***CSERGE, University College London and University of East Anglia, United Kingdom.**

The goal of the research was to test the reliability of transferring values across national boundaries and across policy contexts. Individual's WTP was elicited through the use of a large scale CV survey carried out in five EU countries. Respondents were asked to consider descriptions of up to six different episodes of ill-health associated with exposure to environmental pollution.

To minimize the influences of casual and policy context, the authors state that 'context free' WTP provides a core value that might be more reliably used for the purposes of benefit transfer across population groups. Benefit transfer tests were conducted and revealed that the average error involved on transferring estimates across national borders is 36% when no socio-economic adjustment is made, and 44% when a socio-economic adjustment is made. The authors feel this error range is cause for concern, but does not render BT impossible. To test for contextual effects, a further CV study was conducted, citing either air or water pollution for context. In almost all cases, there was no statistically significant difference between the with and without context answers. The authors believe this is encouraging because it suggests that values can be transferred across contexts where the source of the problem changes.
--...

Piper, S. and W. E. Martin. 2001. Evaluating the accuracy of the benefit transfer method: A rural water supply application in the U.S.A. *Journal of Environmental Management,* **63(3): 223-235.**

The primary purpose of this paper is to evaluate the potential for using pooled primary data from existing studies to estimate a general benefit model, which can then be used in a BT context. This analysis is based on CV data from four regions of the western United States: the Lewis and Clark Rural Water System in southeast South Dakota and portions of western Iowa and Minnesota, the Fort Peck County Rural Water District in north central Montana, the northwest

region of Oklahoma, and the New Mexico portion of the Navajo Indian Reservation. The WTP for domestic water supply improvements was obtained from the four study areas using CV surveys.

Previous studies have included the following criteria for applying benefits transfer.
- The need for identical or very similar resources in the study and policy sites
- Identical or very similar demographic and socio-economic characteristics.
- Similarity of property right assignment and market conditions at the study and policy sites
- The use of explanatory variables for which data are readily available
- Accounting for changes in general attitudes from the time of the original study to the time when the benefit transfer is completed

Ideal BT cases are not likely to occur very often because the conditions at both sites must be identical. If a site-specific model is going to be used for BT to estimate water supply benefits, then the water supply and socio-economic variables must be the same or very similar at the original study site and the policy site to generate reasonable benefit estimates for the policy site.

The use of pooled models using data from a variety of sources allows for more flexibility in the application of the BT method. The results of this analysis indicate that relatively good estimates of the benefits from rural water system improvements can be obtained using a pooled model. BT appears to provide reasonably accurate estimates of natural resource benefits if a broad based benefit model is used. The benefits-transfer-based estimates are accurate as long as a model based on data from a wide variety of conditions is used or the model is based on data from a very similar region.
--Concludes that an MT leading into a BT can certainly be feasible so long as study and policy sites have similar conditions (as mentioned by many studies above)

Piper, S. 2007. Using contingent valuation and benefit transfer to evaluate water supply improvement benefits. *Journal of the American Water Resources Association*, 34(2): 311-320.

Rather than applying CVM in a BT framework, this paper merely demonstrates both methods that are available to small rural water suppliers for evaluating the feasibility of water supply improvements. A CVM application is presented for a potential rural water system in north-central Montana. A previously estimated willingness to pay model is applied to the same area to illustrate the BT technique and the results are compared. Piper uses the BT study mentioned above (Piper Martin).

The paper concludes that due to the limited amount of follow-up work done in the CVM study to account for non-response bias, the WTP estimates are likely to be biased upward (assuming a

significant portion of non-respondents did not return questionnaires due to a zero or very low WTP). Therefore, the benefit transfer estimates may be more representative of true WTP than the CVM based estimates. However, the assumption of benefit transfer that the underlying factors affecting willingness to pay are the same across different sites can also result in errors.
--...

Scarpa, R., Hutchinson, W. G., Chilton, S. M. and J. Buongiorno. 2000. Reliability of benefit value transfers from contingent valuation data with forest-specific attributes. Available at SSRN: http://ssrn.com/abstract=224121 or DOI: 10.2139/ssrn.224121.

The authors want to know how BT performs when conducted conditional on site-specific attributes relevant for recreation. The study assesses the reliability of BT from benefit estimates for forest recreation obtained from a large scale CV study of 26 recreational forests in Ireland that elicited WTP for maintaining the forests. The authors follow the rule that BT estimates must show convergent validity (theoretically and statistically significant relationships with alternative measures of the same theoretical construct such as other site-specific estimates of the same welfare change). The authors believe that previous negative results on BT reliability (Downing and Ozuna) may have suffered from mis-specification and preference instability, or both.

The authors conducted the test across 26 forests and found encouraging results that a number of mean and median WTP transfers fail to reject the null at conventional significance levels. The study confirms the important role of site quality determinants in BT. The data requirement is high as a critical sample mass of CV responses are required across numerous sites and a homogenous set of site-specific attributes must be chosen to describe the recreational appeal of each forest. The authors recognize that very often, analysts do not have access to multi-site data set as good as the one supporting the present analysis. They believe further research is needed to determine the conditions under which the cost of conducting on-site surveys necessary to estimate the BT function are offset by the saved expenses of an extra on-site survey.
--Nothing new

VandenBerg, T. P., Poe, G. L. and J. R. Powell. 1995. Assessing the accuracy of benefits transfers: Evidence from a multi-site contingent valuation study of groundwater quality. WP95-01. Ithaca , NY : Cornell University, Department of Agriculture, Resource and Managerial Economics.

The authors examine the relative accuracy of alternative BT methods for improvements in groundwater quality. The data for the analysis is taken from a CV study of groundwater quality. The multi-site study offers a unique opportunity for assessing the above stated hypothesis and relative accuracy of transfers. Questionnaires were mailed concurrently to 12 towns, selected on

the basis of population size, reliance on groundwater for water supply and history of groundwater contamination.

The authors find that aggregating several towns to form study sites improves the accuracy of benefit function transfers, and to a lesser extent, naïve transfers. The authors note that in practice, BT do not typically use all available study sites. Applying prior information and judgment, researchers frequently group particular study sites into like categories for assimilation into the analysis, while omitting other sites. The authors state that clearly, study site town aggregation plays an important role in the relative accuracy of transfers, a point the BT practitioners need to recognize in further research. Future BT research should apply techniques analogous to those used in this study to determine if these results can be replicated for different commodities and for transfers across studies. Such efforts will improve understanding of transfer accuracy and suggest methods to improve transfer reliability.
--Conclude MA leading to BT can work

U.S. Environmental Protection Agency. 2000. Guidelines for preparing economic analyses. Report 240-R-00-003. Washington, DC: Office of the Administrator, USEPA: http://yosemite1.epa.gov/ee/epa/eed.nsf/pages/guidelines.
--When drawing from these studies—and when using quantitative estimates of any kind—analysts should carefully assess the quality of the data and should clearly state the reasons for their analytical choices. As with any analytical exercise, the maxim "garbage in, garbage out" always applies. (59)

-- Currently, a systematic process for conducting benefit transfer does not exist. There are, however, well-accepted steps involved in the process. When conducting a benefit transfer, one should make certain that each of the following steps are carried out carefully: (86)
1) Describe the characteristics, population, and consequences of the policy case
2) Identify existing, relevant studies
3) Review available studies for quality and applicability. Assessing quality means the analyst should understand the methodology used in the primary study and judge that study accordingly. Assessing applicability means the basic commodities must be essentially equivalent, the baseline and extent of the change should be similar, and the affected populations should be similar. Adjustments can be made if necessary and feasible.
4) Transfer the benefit estimate.
    a. Point estimate (or range of values)—not generally recommended, or can be adjusted using expert judgment
    b. Benefit function
    c. Meta-analysis—get benefit function though meta-analysis (more global benefit function)
    d. Bayesian Techniques

5) Address uncertainty—describe all judgments and assumptions along the way

Zanderson. M., Termansen, M. and F. S. Jensen. 2007. Testing benefits transfer of forest recreation values over a twenty-year time horizon. *Land Economics*, 83(3): 412-440.

--Even fewer studies explicitly test the reliability of transfers over time even though most spatial benefit transfers are estimated on historic data. Downing and Ozuna (1996) investigate the reliability of function and welfare transfers over a short period of time (3 years). Although they come to the conclusion that many transfer functions are statistically equivalent to the original functions, they conclude that transferring values over time is not reliable. Loomis (1989), on the other hand, finds evidence that willingness to pay is relatively stable over short periods of time (nine months) when the determinants of willingness to pay stay constant. To our knowledge, there have not previously been any attempts to validate benefit transfers over periods longer than three years. In this paper, we test the accuracy of benefit transfers of recreational values over a period of 20 years, for 52 forests in Denmark.(412-413)

--In this article, we test the accuracy of value function transfers over a 20-year time period at the individual site level by using a multi- .site model with a mixed logit specification,which allows for heterogeneity in preferences across the population. We combine the model with the use of GIS. following the approach of Termansen. McClean. And Scarpa (2004), to capture a larger proportion of site heterogeneity using a spatially disaggregated representation of forest sites. Furthermore, this allows us to account for the spatial pattern of population density and other demographic characteristics. (Basically they allow preferences to vary to see if benefits function would be different over time –from 1977-1997 (414)

--They find benefit functions (set of coefficients) to be very different in 1977 and 1997. (423)
--We see two sources of this change, which cause the transfer errors: a shift in transport mode, illustrated by the differences in error margins between transfer model "A" and model "B," and a change in preferences towards forest attributes (427)

-The present paper has given an indication of the order of magnitudes one can experience when the determinants of willingness to pay change significantly over almost two decades, even when using stateof- the art transfer models combined with GIS. (429)

--Benefit transfers cannot replace original research, especially when the costs of being wrong are high (Rosenberger and Loomis 2001). The policy context and process will most often dictate the acceptability of transferred data. (430)